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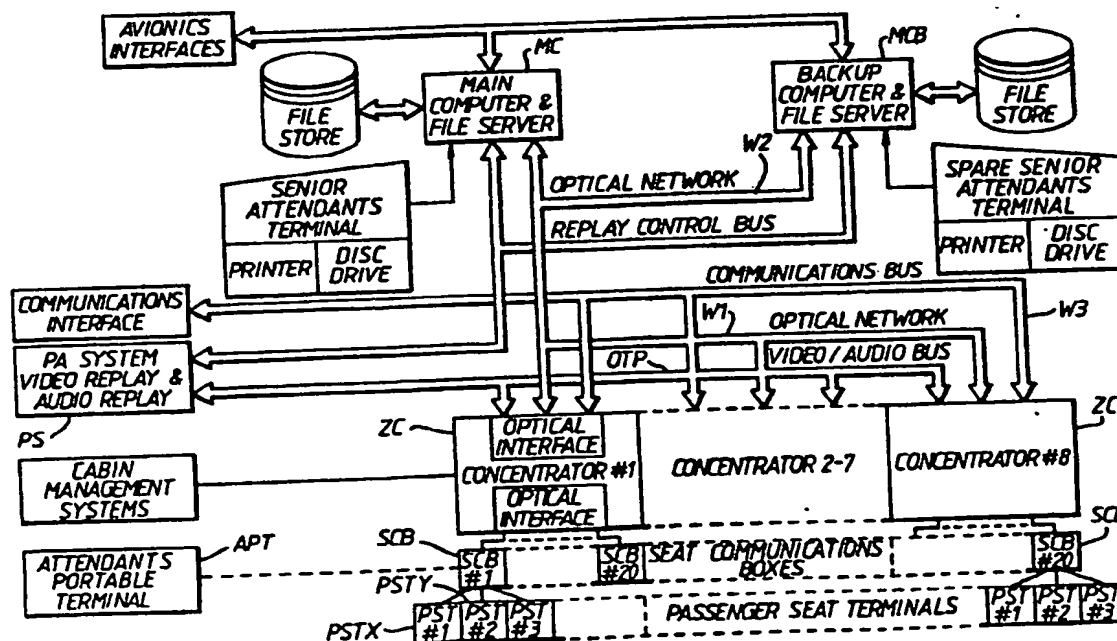
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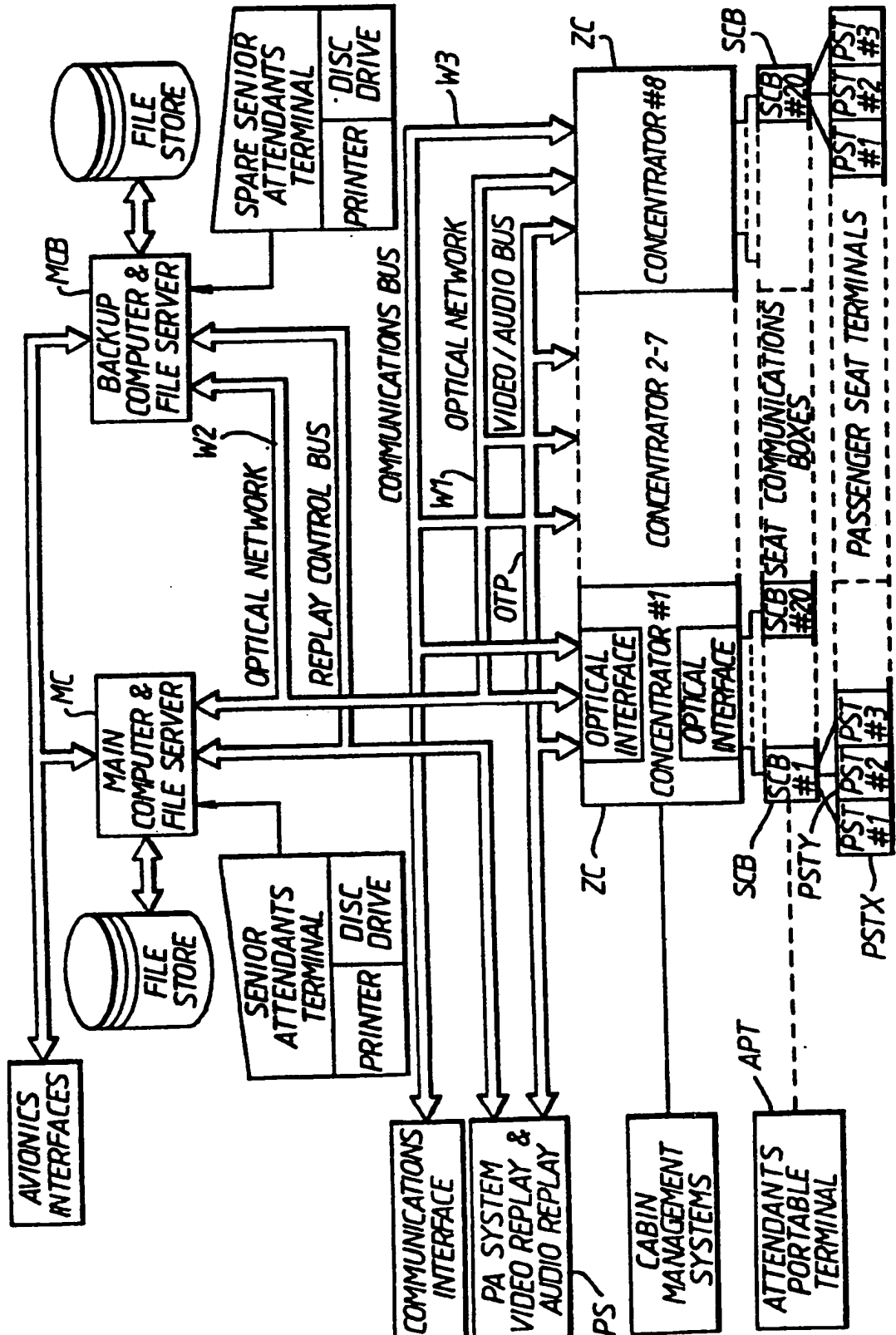
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(54) **Entertainment and services system**

(57) An integrated entertainment and services system for aircraft etc comprises an hierarchical structure including top level computer/data base, communications and entertainment equipments which are accessible through intermediate level switching equipment ZC which in turn is selectively accessible to specific terminal (e.g. seat) locations PST through low level switching equipment SCB.



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## **IMPROVEMENTS RELATING TO ENTERTAINMENT AND SERVICES SYSTEMS**

This invention relates to entertainment and services systems and relates more specifically to integrated entertainment and services systems for use in passenger carrying vehicles (e.g. aircraft), hotels, stadiums etc for providing a wide range of selected entertainment and services at specific terminal (e.g. seat) locations.

One major problem with an integrated entertainment and services system required to provide the various facilities as set out hereinafter aboard a passenger carrying vehicle for example is that of getting signals from a multiplicity of wide-band sources to individual users on request when the necessary bandwidth is impractically large to send all channels to all terminals for local selection.

Supplementary problems involve inter-system interference and reliability, especially on a passenger carrying vehicle; communicating by voice with remote persons within the same installation or externally; communicating 'electronically', particularly with or from a passenger carrying vehicle; ease of use of system; the availability of a small number of attendants coping with a lot of persons wishing to pay for goods and services at the same time; and the businessman away from home or office needing access to word processing or other software packages, particularly on a passenger carrying vehicle.

The present invention has in view a combined entertainment and services system for use in multiple passenger carrying vehicles,

hotels, conference centres, stadiums, etc. Each seat position in a vehicle for example may be provided with a terminal comprising a display screen, audio transducers, and controller enabling the selection by a customer of a range of entertainments and services. The system is such as to allow simple addition or removal of services and utilities to suit customer requirements. It is envisaged that the following basic entertainments and services may be provided:-

#### Video Games

These are computer generated interactive games similar to those found in amusement arcades and on domestic games computers. The user may play them using the video, audio and controller facilities of their terminal.

#### Casino Games

These are computer representations of games involving gambling, including card games and 'slot machines'. The user may play them using the video, audio and controller facilities of their terminal. Credits may be entered into the system before play to be used as gaming 'chips' or machine tokens.

#### Video Films and Audio Programmes

Provision may be made for the play-back and transmission over the system to the user terminals of pre-recorded video and audio programmes; the minimum provision is for eight video channels and sixteen audio channels of which eight are video sound-track. All of these shall be capable of carrying high quality stereo

signals. The minimum provision may be expanded upon by the use of additional equipment.

#### Mail Order

Merchandise catalogues may be stored in the system database which is accessible to customers via their terminals. Whilst the database is being accessed for a specific page or topic, advertising may be shown.

#### Duty Free Sales

Systems installed in passenger carrying vehicles that cross national boundaries where duty free sales are allowed may hold a catalogue of such items in the database which is accessible from terminals by the passengers. Such goods could be handed to passengers when leaving the vehicle or be picked up within the destination terminal.

#### Other Goods Sales

A catalogue of souvenir items specific to the system operator or other goods for immediate delivery to, or later collection by, the user may also be provided and accessible from the user's terminals. This may be used to facilitate "Room Service" in hotels, etc.

#### Bureau de Change

Where required and where allowed by law the system may be used to facilitate currency exchange between currencies in the system database.

### Transaction Currency

Payments into the system may be accepted in any of the currencies supported for currency exchange. Credit available for use by passengers can be represented in the currency of their choice.

### Advertising

The system may provide for the storage and display at the user terminals of advertising material from an advertisement database. This may include short still advertisements (which may be randomly accessible) and short animated advertisements held digitally; also pre-recorded video material programmed with film, news, etc.

### Communication Services

Telephone like facilities may be provided between users of the system, enabling communication between people seated in different parts of the building, vehicle, etc. The system may also provide an interface with a public correspondence system, such as the terrestrial flight telephone system, which would enable the user terminals to be used as telephones (air to ground, ship to shore, etc). The main system terminal may also have facsimile or telex capability.

### Reservations

This facility offers a reservation service which may be for travel, including car hire, air travel, sea travel, etc; accommodation, including hotels; and services such as restaurant bookings, etc. A menu of reservations may be held in the database and presented to

the user's terminal on demand for selection as required. Such services may be franchised to a major travel agent, hotel chain, etc. The bookings may be confirmed using the communications facility.

#### User Access to System

The individual user interfaces may be as follows:-

A visual display screen (usually of not less than twelve square inches picture area) providing good quality full colour video film reproduction. This screen may be suitable for installation in walls or bulkheads, tables or desks, seat backs or armrests, etc. The display may be adjustable for brightness to account for the range of ambient illumination that will be encountered in service.

A control unit/keypad may allow selection of all facilities and control of games. If it is to be used on an umbilical cable, or without physical attachment, it may be light weight and easy to handle. A number of key switches and a means of moving a screen cursor may be provided on the keypad.

Provision may be made for the use of a security "key" to prevent use of a terminal by unauthorised personnel whilst the rightful user has left it unattended.

A credit, charge or debit card reader may be fitted to facilitate payment for services. Cards may be checked against a 'blacklist' from the card company held on the system database and/or accessed via the communications services. The list of acceptable cards may be programmed according to the requirements of the system operator.

An audio headset may provide high quality stereo reproduction. This may be easily disconnected via a jack plug or similar arrangement for sanitization after use.

A microphone may provide telephone quality audio as a minimum and may form part of the keypad or headset. Whatever installation position is used the microphone may be easily accessible for sanitization after use.

Operation of the system by the user may be as simple as possible using on-screen prompts and easily followed menu presentations.

The terminal units may be detachable for maintenance purpose using special tools. This enables replacement of damaged units by authorised persons, but discourages theft or entry by others.

Provision could also be made for the attachment of more capable terminals for passenger use to run business applications, word processing, etc., hard copy print outs could be provided by a senior attendant's terminal mentioned below.

#### Hard Copy Receipts and Vouchers

The system may provide printed copies of all passenger net balances at end of flight. Transactions between any attendant and the user may be confirmed with a hard copy voucher at the point of sale.

#### Information Services

For a passenger carrying vehicle such information as vehicle position, speed, distance travelled, time remaining, estimated time of



arrival and weather at destination may be displayed as well as data specific to particular types of vehicles such as altitude in the case of an aircraft. For hotel applications details of meal times, sports facilities available, local attractions, etc could be provided.

Control and supervision of the system may be achieved via the system supervisor's or senior attendant's terminal. This may comprise a display, full function keyboard and printer. It may also provide removable data storage media for removal of accounts, usage statistics, etc for remote analysis.

#### Attendant's Portable Terminals

A portable terminal may be available for attendants who are to assist users at their seat. This may comprise a display, alpha-numeric entry key board, printer, and may also have a card reader for credit, charge or debit cards. There may be memory provision so that any accounting, or other data can be carried back to the senior attendant's terminal, if necessary. The terminal may be lightweight and easily held in one hand while operated with the other, it may be supported by a shoulder strap or similar.

#### Interfaces

The system may need to provide interfaces to other installations in order to carry out some of its operations. These may include the following:-

The audio distribution system may interface with any existing public address system in the place of installation and accept external commands for safety announcement override.

Interface may be provided to navigation systems on a vehicle.

Communications interfaces depend on the location of the installation, but may include satellite communications systems; line of sight VHF/UHF air to ground, ship to shore, etc; standard data transmission systems; etc.

Utilities, such as reading lights, attendant call, etc.

### Security

The potential value of financial transactions handled by the system may be very high, therefore high security of the system against unauthorised access or deliberate change may be essential. The level of security achieved for a particular installation will usually be determined by cost and degradation of other system features such as ease of use, response time, reliability, size and weight. The security measures may include limits to physical access to system components, encoding of data, passwords and other identifiers. data validity checking and physical 'keys' etc.

### Service Quality

Built in test facilities may provide an indication to the attendants or system supervisor of any system failures and degradation (partial failure).

### System Statistical Data

Statistical data may be collected and stored on the system database and may be easily transferred to an external database via the communications services or via removable storage media. These

statistics may include information on the use of games, advertisements shown, system maintenance requirements and any operator-specific requirements.

European Patent Application No. EP 0 277 014 entitled "Service and Entertainment Communication System" describes a system providing some of the above-mentioned facilities, in which a communication mechanism is provided wherein audio signals are encoded into a video channel and frequency division multiplexed on to a transmission medium with other video signals. Each receiving terminal contains tuners for the selection of specific video and audio signals from the multiplexed ensemble. This system has limited scope for future enhancement in terms of numbers of channels provided. The bandwidth of the long transmission paths throughout the installation needs to be sufficient to carry all the channels at once.

One objective of this invention is to provide a system featuring a different entertainment programme or service selection mechanism which enables additional programme material to be added later without increase in bandwidth on the long transmission paths.

United States Patent Serial No. 4 647 980 entitled "Aircraft Passenger Television System" described a system having a viewing screen at each seat fed from several video sources such that each screen is integrated with a channel selector to select one video for display. A "television module" is provided incorporating channel selection controls etc with the display screen.

Another objective of this invention is to provide a system which does not incorporate channel selection controls or tuners with the display.

Moreover, the system described in United States Patent Serial No. 4 647 980 is incapable of two-way signal transmission between a central unit and a plurality of remote units mounted on aircraft passenger seats, and is incapable of transmitting signals other than video programmes (e.g. computer game programs) from a central unit to a plurality of remote units. It is desirable for the system to have the capability for both.

In both European Patent Application No. EP 0 277 014 and United States Patent No. 4 647 980, a headset is attached to the seat in front of the seat location where the services etc are provided. This impedes passenger access to the aisles and thus presents an unacceptable safety hazard on a passenger carrying vehicle.

The headset, including microphone and controlling keypad should desirably be attached to the arm of the seat occupied by the user and should preferably be easily detachable by the attendant so as to be collected for sanitization, as necessary, after use.

United States Patent Serial No. 4 584 603 entitled "Amusement and Information System for Use on a Passenger Carrier" describes a system on a passenger carrier having a plurality of seats with a display on the back of each seat, a 'key means' connected to each display and a set of transparent plastic trays through which the display may be viewed when the tray is stowed away. This arrangement may be ergonomically undesirable in that, if the tray is at the optimum height, the display is too low for comfortable

viewing. Alternatively, if the display is at optimum height the tray will be too high.

It is desirable that the system does not feature such a tray, although not precluding the fitting of a conventional seat back tray to each seat as required. It is also not essential to have the display mounted in a seat back; it could, for example, be mounted on an articulated assembly attached to the seat arm. The system should not be exclusively for 'Passenger Carriers'. It should be adapted to be fitted in hotels, conference centres, etc.

In an integrated entertainment and services system the problem of getting signals from a multiplicity of sources to the individual system users on request when the bandwidth of sending all channels to all terminals is impractically large is overcome by providing in accordance with the present invention an integrated entertainment and services system comprising an hierarchical structure with signal sources localised at one or more centres at a top level of the hierarchical structure whereas at the bottom level of the structure all the user terminals are split up into small groups (e.g. associated with one multiple seat assembly on a vehicle) each of which is serviced by a local communications box, in which only those signals requested by the users in a group are sent to the communications box thus limiting the link bandwidth to  $N$  times the single channel bandwidth, where  $N$  is the number of units in the local group, in which at the intermediate level of the hierarchical local structure the local groups are grouped together to form a small number of super groups (e.g. all the terminals for one floor of a hotel) each serviced by a zone concentrator and in which the concentrator

accepts service and entertainment material from a multiplicity of video, audio and data sources, the high bandwidth channels being required for this being few compared to many cable runs between concentrators and communication boxes.

In carrying out the invention it is not essential to have all the material sent to all the concentrators. Some operators may wish to provide different material to different zones, this is easily accommodated in the installation cabling.

In large systems additional levels may be provided in the hierarchical structure which can be implemented as required to limit the 'span of control'.

For safe and reliable operation, all of the systems on a passenger vehicle must be compatible in operation. Hitherto, a major source of incompatibility has been due to electromagnetic interference. Some systems may be susceptible to incorrect operation as a result of electromagnetic fields impinging on them so it is necessary to ensure that other vehicle systems do not radiate such fields. On a more mundane level, however, external electromagnetic interference could cause problems with the picture or sound quality of the services and entertainment system provided and although this is not a direct hazard to safety it can result in loss of trade. Two features of the system according to the present invention cut down the possibility of interference with or from other systems. One is the limited bandwidth of the majority of communications links and the second may be provided by the use of optical transmission, optical signals, particularly in waveguides such as fibres, do not couple electromagnetically with other systems in

such a manner as to cause interference. The converse also holds, the system of the invention cannot be affected by electromagnetic coupling with the optical signals.

The detailed scrutiny of the services and entertainment system of this invention by users will demand high system reliability, particularly on a passenger vehicle where qualified maintenance personnel are unlikely to be immediately available. Failures at the top level of the hierarchical structure will affect all the users whereas the failure of one audio or video source will not cause too much inconvenience since there will still be other channels to choose from. Failure of a main computer in the top level of the hierarchical structure will in effect remove access to all material for which charges are levied and this is clearly undesirable. The use of multiple redundant equipments in the system overcome this problem since in case of failure of one equipment another can take over and sustain system operation until maintenance actions can be carried out. In case of failure of single terminals or groups the attendant can enter the information via a senior attendant's terminal so that the system can print out maintenance requirements at appropriate times (e.g. at the end of the journey in the case of a vehicle). The controller keypad, which is most prone to damage by users, can be readily replaced by an attendant using a special tool.

The provision of a (radio) telephone and its derivatives in the system will solve the problem of communication by voice with remote persons, both local and distant. The audio channel of a video/audio entertainment equipment may be used for the receiver

and to provide facilities on a per seat basis in a passenger vehicle for example.

For the purpose of "communicating by data" encompassing electronic mail, telex, etc the system provides the basic hardware facilities in order to provide services and entertainment and communication by data facilities can therefore be added without the need for additional equipment on the passenger vehicle.

Once the services and entertainment system according to the invention is in place reservations, mail order and like facilities can be provided without the need for additional equipment on the passenger-carrying vehicle or other base for the entertainment/services system. The communications facilities allow for confirmation of reservations, or orders, before the passenger leaves the vehicle or the user leaves the hotel etc. Although such facilities as Prestel may be available for use in fixed places, they are not usually provided on a per room basis in hotels etc. Also the quality and form of displayed material may be much higher in the case of the system according to the invention. For example, Prestel cannot show photographs.

The system according to the invention can be used without the need for lengthy explicit instructions.

The system of the previously mentioned United States Patent No. 4 647 980 incorporates a simple channel selection switch or tuner. This is clearly impractical for a large number of available channels. The previously mentioned European Patent Application No. 0 277 014 has a similar arrangement wherein a channel number display is controlled by up and down keys to select the desired



programme. In addition to this it provides a menu, on the display, of games that may be played on the local computer. This may be scrolled by the use of two different switches in order to select the game of choice. The system of this invention improves on this in two key areas. Firstly, from the point of view of the user, the same mechanism is used for selection of every optional service and entertainment programme. Secondly, the menu on the screen is multidimensional. By this is meant that, unlike the European Patent Application No. 0 277 014 system, it may be scrolled sideways and 'inwards'. Once the system is introduced and the user is ready the first menu page is shown and a mechanism, described below, is provided for moving a cursor. The user may either scroll down the displayed list or move sideways onto another list of selections. Once the cursor is pointing to the required option, e.g. music, a key may be pressed to select it. This either results in display of the requested information or a relevant sub-menu, e.g. types of music available, in which case the process is repeated. The mechanism for moving the cursor may be any two dimensional control means such as a joystick, tracker ball, four keys, etc. The same mechanism may be used for playing some of the video games. As a cosmetic detail the cursor may be displayed in a form relevant to the installation or to the menu selected, e.g. the silhouette of an aircraft for a flight information menu.

As regards the previously mentioned problem of a small number of attendants coping with a lot of people wishing to pay for goods and services at the same time, installations of the system according to this invention can cater for hundred of users at one time

and system operators will require charges to be levied for many of the services and entertainment programmes. This is straightforward in a hotel as the charges may be added to the room bill. A problem arises in conference centres, vehicles, etc where the users occupation of the terminal area is (relatively) transitory. In this case the system of the invention may provide a magnetic card reader at each user terminal. This enables the user to pay 'on line' with a credit, or similar, card. The details of the transaction will depend on the merchant agreement struck between the card company and the system operator. This is a novel feature for services and entertainment systems in general. It is also a novel feature to provide a point of sale terminal in a vehicle, particularly on a per seat basis. The reduced work load of the attendants, who only have to deal directly with cash or cheque users, is eased even more by the use of a portable terminal.

As regards the problem of the businessman away from home or office needing access to word processing or other software packages, particularly for use on a vehicle, the problem may be solved in a similar way to the communications by voice problem, most of the equipment required is inherent in the basic services and entertainment system. All that is required is the provision of a 'full function keyboard' and the appropriate software. This facility is really intended for the person wishing to prepare meeting minutes, rather than the novelist, as the print out is normally to be provided centrally. A draft quality printer could be provided locally if required. Magnetic media copies could also be provided, although

there are problems due to the non-standardization of such media formats.

Referring to the problem of safety of a 'seat back video' installation with trailing wires impeding access to aisles which is particularly important for emergency evacuation of a vehicle.

Unlike European Patent Application No. 0 277 014 and United States Patent No. 4 647 980, the headset will not be attached to the seat in front. This impedes passenger access to the aisles and thus presents an unacceptable hazard to safety on a passenger carrying vehicle. The headset, microphone and controlling keypad will instead be attached to the arm of the seat occupied by the user. They will be easily detachable by the Attendant so as to be collected for sanitization as necessary after use. The communications box for that group of seats will provide the audio and data channels directly to the seat arms, the video channel will be provided via under-floor, etc., cable connection to the seat assembly in front carrying the display device.

By way of example an embodiment of the invention as incorporated in a passenger carrying vehicle (e.g. aircraft) will now be described with reference to the accompanying single figure drawing.

Referring to the block schematic diagram of the system illustrated in the drawing the subject system implements an integrated entertainment and services system using an hierarchical structure providing two way transmission paths thereby improving on the parallelism of the system according to US Patent No. 4 584 603. The long transmission paths in this hierarchical structure are

implemented optically by using glass and/or plastic fibres as wave guides as indicated at W1, W2, W3 etc. This improves upon the system of European Patent Application No. 0 277 014 in that no electromagnetic interference will be induced in other vehicle systems by the optical signals. The "cable means" of the cited system particularly the leaky feeder proposed therein, will generate interference and so require careful attention to the installation and screening of all vehicle systems to ensure their integrity and safe operation.

Initiation and on-going control of the system operation is carried out by a main computer MC at the top of the hierarchical structure. This computer MC includes a file server, providing access to the system storage media for the computer and other computers lower down in the hierarchical structure. A back-up main computer and file server is shown at MCB. The storage medium may be partitioned such that records that are to be changed during operation, e.g. usage statistics, may be held in read-write magnetic media whereas ones that are to remain constant throughout an operation, e.g. mail order catalogues, may be stored on read only optical media. In order to ensure reliable operation and to preclude loss of important records, e.g. accounts, the main computer and file server is multiple redundant (usually dual). This means that each hardware component is replicated; in the event of failure of one computer another can take over, so allowing correct operation to continue without the need for immediate maintenance action.

The vehicle will be split into passenger zones, either notionally or by following physical partition e.g. a railway carriage

compartment arrangement. Each zone will be provided with a computer and switching apparatus, called a zone concentrator as indicated at ZC; an optical communication system; a power distribution system and a set of passenger seat assemblies such as the assemblies PST1, PST2 and PST3. An optical local area network links the main computers MC and MCB file servers with the zone concentrators next down in the hierarchical structure. The zone concentrator is thus able to load data, via the file server, into its internal memory so as to give a quick response when that data is requested by a passenger. Statistics of usage on past journeys can be used to assess which data are to be so stored. These data include programs that can be requested by a passenger to be run.

The zone concentrators ZC also accept digitised video and audio material via optical transmission paths OTP from programme sources PS such as video tape players, broadcast receivers, audio compact disc players, solid state storage, etc. The sound-tracks of the video programmes are routed via the audio programme transmission media. At the zone concentrator the selected audio and data digital signals are combined with the selected video digital signals for onward transmission to the passenger. This is done with no overall increase in bandwidth on the video channel by inserting the audio and data samples in the period normally occupied by the frame and line synchronisation markers. Circuits in the receiving apparatus reconstitute the video, audio and data as necessary. Synchronisation is achieved by coding in the digital video signal. Video cameras could also be provided giving a 'pilot's' eye view ' from the aircraft, for example.

The zone concentrators ZC are also responsible for handling the telephone communications between passengers and parties on or off the vehicle. An hierarchy of "telephone exchanges" may be implemented to control and route communications channels. Communications between passengers within a zone are handled exclusively by the local zone concentrator whereas communications between passengers in different zones are routed by the higher level exchange via a special inter-concentrator communications bus W3. That bus W3 can also be used to link zone concentrators with satellite communications terminals (not shown) UHF or radio equipment, etc., so enabling communication of vehicle.

Unlike European Patent Application No. 0 277 014, all the programme and services material is not made available to all seats all the time. Only that data requested by a passenger, plus any system information such as announcements, are transmitted to a seat terminal (e.g. PST1) thus requiring a reduced bandwidth over the channel, allowing the use of lower cost components and providing 'unlimited' expansion capability.

Each passenger seat assembly (e.g. PST1, 2, 3) comprises a group of seats mounted side by side. These are usually arranged in twos or threes, as higher numbers make it difficult to gain access to the aisles. Associated with each assembly is a seat communications box SCB which handles the data flow between zone concentrators ZC and that group of passengers. This box also contains computers so that passengers may down-load and interactively run programs, e.g. 'video' games. It also contains telephone coder/decoder circuitry for passenger voice communications.

Provision is made for an attendant to communicate with the system from the aisle adjacent to a seat position. The Attendant uses a portable terminal APT to enter data on behalf of a passenger, e.g. to record cheque or cash payment for goods, depending on implementation and the special needs of the application, the Attendant's portable terminal APT may communicate with the seat communications box by wire, optical fibre unguided optical transmission, sonic transmission, etc (not shown).

Passenger's access to the system is enabled via the passenger seat terminal PSTX, PSTY etc which is a set of peripheral devices of the seat communication box. These peripherals comprise a controlling keypad, a display screen, an audio headset, a microphone, a magnetic card reader and a security device. This latter device is to prevent other passengers gaining access to entertainment or services that have been paid for by a passenger but not yet used when that passenger wishes to leave their seat unattended for a period.

The magnetic card reader may be embedded in the keypad or display assemblies. It is used to accept payment for entertainment, goods and services from credit, debit, charge, etc cards. The security device could be implemented as a magnetic card carrying passenger identify information, e.g., address for mail order goods delivery. This would be read by the card reader and held in the machine until the passenger removes it on leaving his seat. The card could be issued with, or as, the vehicle boarding pass, etc.

The microphone is for telephone communication; it may be separate, mounted on a 'boom' on the headset or form a part of the keypad assembly. The audio headset is for listening to the audio

element of entertainment programme, acts as the telephone earpiece and as a receiver for service or safety announcements. Safety announcements will interrupt and override all other services.

The display may be mounted in the back of the seat directly in front of the viewer, as in US Patent No. 4 647 980 or 4 584 603. Alternatively, it may be mounted on a bulkhead partition or on an articulated adjunct to the seat arm that may be folded away when not in use and brought forward and adjusted for comfortable viewing of programme material or service information.

The available services will be offered to the passenger by a series of menus displayed on the screen. The keypad will include means to control a 'cursor', or pointer, on the screen; the passenger points with the cursor to the option required and enters their selection. Top level menus will lead to sub-menus, e.g. if the passenger has selected to view a video the next menu will provide a list of available titles and start times, additional information may be called up if required. The cursor may be in the form of an animated character or icon; this may be related to the installation, e.g. based on the company's logo or mascot, or it could be related to the category of sub-menu being viewed.

Although in the specific embodiment described the system is embodied in a passenger-carrying vehicle (e.g. aircraft) it should be appreciated that the system of the invention is also applicable to hotels, stadiums etc.



## **CLAIMS**

1. An integrated entertainment and services system for providing a range of selected entertainment and services at a multiplicity of specific terminal (e.g. seat) locations in a passenger carrying vehicle or other installation, in which the system comprises an hierarchical structure including top level data base/computer, communications switching and entertainment programme equipments, in which access to these top level equipments is afforded the multiplicity of terminal locations through a plurality of intermediate switching equipments each of which is accessible to a group of lower level switching equipments serving respective groups of terminal locations of the system.
2. An integrated entertainment and services system as claimed in claim 1, in which the intermediate switching equipments comprise zone concentrators including computers and appertaining to different zones of the system installation.
3. An integrated entertainment and services system as claimed in claim 1 or 2, in which the lower level of switching equipments comprise communications boxes including computers and other equipment.
4. An integrated entertainment and services system as claimed in any preceding claim, in which the entertainment programme source equipment provides public address and selectable entertainment